

# Work Order ID 50628 ✓

July 17, 2009 11:41:27 AM



Page 1

Item ID: D350-748-141TRN  
 Revision ID: D  
 Item Name: Crosstube Turning Detail  
 Start Date: 7/24/09 Start Qty: 1.00  
 Required Date: 8/14/09 Req'd Qty: 1.00  
 Reference:

Accept



Setup Start



Stop



Cust Item ID:

Customer:

Approvals: Process Plan: *[Signature]*

QC:

Date:

Tooling:

Date:

Date:

SPC (Y/N):

Date:

Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Draw Number	Draw Rev.	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	----------------	--------------	--------------	---------------	---------------	------------------	----------------

Draw Nbr	Revision Nbr
D350-748-141	Rev D

100

0.00



Mori Seiki

MORI SEIKI CNC LATHE LARGE

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs on both ends as per Folio FA648□2-Turn first side as per Folio FA648□3- File transition lines smooth.

*G.M. 09-09-14 @*

110

0.00



QC

QC1- Inspect dimensions to dimension sheet

Memo

0.00

Quality Control

*O.M. 09-09-14 @*

120

0.00



Mori Seiki

MORI SEIKI CNC LATHE LARGE

Memo

0.00

Mori Seiki CNC Lathe Large

1-Turn second side as per Folio FA648□2- File transition lines smooth.□3- Scribe Part & Batch as per Dwg D350-748-141

*G.M. 09-09-14 @*

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Work Order ID 50628

July 17, 2009 11:41:27 AM



Page 2

Item ID: D350-748-141TRN

Accept



Setup Start



Revision ID: D

Stop



Item Name: Crosstube Turning Detail

Start Date: 7/24/09 Start Qty: 1.00



Cust Item ID:

Required Date: 8/14/09 Req'd Qty: 1.00

Customer:

Reference:

Run Start



Approvals: Process Plan:

Date:

Tooling:

Date:

Stop



QC:

Date:

SPC (Y/N):

Date:

Sequence ID/  
Work Center ID

Operation  
Description

Set Up/  
Run Hours

Draw  
Number

Draw  
Rev.

Plan  
Code

Accept  
Qty

Reject  
Qty

Reject  
Number

Insp.  
Stamp

130

QC1- Inspect dimensions to dimension sheet

0.00



QC

Memo

0.00

Quality Control

0.00 0.00 - 0.00 - 14

140

QC8- Inspect parts - second check

0.00



QC

Memo

0.00

Quality Control

1 0 - AWM9-10-06

150

Large Fab

0.00



Large Fab

Memo

0.00

Large Fab

Grind machining marks

1 0 - AWM9-10-06

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

**Work Order ID 50628**

July 17, 2009 11:41:27 AM



Page 3

Item ID: D350-748-141TRN

Revision ID: D

Item Name: Crosstube Turning Detail

Start Date: 7/24/09 Start Qty: 1.00

Required Date: 8/14/09 Req'd Qty: 1.00

Reference:

Accept



Setup Start



Stop



Cust Item ID:

Customer:



Run Start



Stop



Approvals:

Process Plan:

Date:

Tooling:

Date:

QC:

Date:

SPC (Y/N):

Date:

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run HoursDraw  
NumberDraw  
Rev.Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

160



Outsource I

Outsource process - Heat Treat

0.00

Memo

0.00

Outsource process - Heat Treat

Issue P/O: 10539 ☐ Heat Treat to min 180 KSI As per Dwg D350-748-141 ☐ (MIL-T-6736 OR AMS 2759-1C) ☐ Sand Blast tube after Heat Treat ☐ Possible Supplier: Vac Aero ☐ Ensure Certificate of Conformity is attached

09-10-7

170



Packaging

Receive &amp; Inspect for Damage &amp; Mat'l Certs

0.00

Memo

0.00

Packaging

Ensure certificate of conformaty is attached

09/11/06

180



QC

QC6- Inspect dimensions to drawing

0.00

Memo

0.00

Quality Control

07/24/0907/24/09

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

**Work Order ID 50628**

July 17, 2009 11:41:27 AM

Page 4

Item ID: D350-748-141TRN

Revision ID: D

Item Name: Crosstube Turning Detail

Start Date: 7/24/09 Start Qty: 1.00

Required Date: 8/14/09 Req'd Qty: 1.00

Reference:

Approvals: Process Plan: \_\_\_\_\_

QC: \_\_\_\_\_

Date: \_\_\_\_\_

Tooling: \_\_\_\_\_

Date: \_\_\_\_\_

Date: \_\_\_\_\_

SPC (Y/N): \_\_\_\_\_

Date: \_\_\_\_\_

Run Start

Stop

Sequence ID/  
Work Center IDOperation  
DescriptionSet Up/  
Run HoursDraw  
NumberDraw  
Rev.Plan  
CodeAccept  
QtyReject  
QtyReject  
NumberInsp.  
Stamp

190



Packaging

Packaging

Packaging

Memo

Identify and stock in kanban rack ☐ Location: Back

0.00

0.00

200



QC

Quality Control

QC21- Final Inspection - Work Order Release

Memo

0.00

0.00



Accept



Setup Start



Stop



Cust Item ID:

Customer:

Run Start

Stop

09/11/24   
JMF 09-11-23

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



# Picklist Print

July 17, 2009 11:41:27 AM

Page 1

Work Order ID: 50628

Parent Item: D350-748-141TRNRevD

Parent Item Name: Crosstube Turning Detail

Comments:

Start Date: 7/24/09

Required Date: 8/14/09

Start Qty: 1.00

Required Qty: 1.00

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Remaining Qty To Pick	Qty Issued	Date Issued	Status
D6017-115RevA		Manufactured	No			110	Each	42.0000	1.0000			



Crosstube Material



0.00 09-09-14 ①

Warehouse

Loc Qty

Loc Code

Location

Main Warehouse

LG

42

32912

42

1

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

<b>DART AEROSPACE LTD</b>		<b>Work Order:</b> 50628
<b>Description:</b> Crosstube Assembly (AS350/355 High Fwd)		<b>Part Number:</b> D350-748-141
<b>Inspection Dwg:</b> D350-748-141 Rev: D		<b>Page 1 of 1</b>

### FIRST ARTICLE INSPECTION CHECKLIST

☒ First Article ☐ Prototype

Inspection Sheet Drawing Dimension	Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.240	+0.005/-0.000	2.240	/		
	2.180	+0.005/-0.000	2.184	/		
	2.180	+0.005/-0.000	2.185	/		
	2.237	+0.005/-0.000	2.242	/		
	2.272	+0.005/-0.000	2.277	/		
	2.306	+0.005/-0.000	2.307	/		
	2.339	+0.005/-0.000	2.339	/		
	2.339	+0.005/-0.000	2.339	/		
	0.062	+/-0.010	0.062	/		
	4.26	+/-0.030	4.289	/		
	R0.063	+/-0.010	R0.063	/		
	R0.50	+/-0.030	R0.500	/		
SIDE B	2.240	+0.005/-0.000	2.240	/		
	2.180	+0.005/-0.000	2.184	/		
	2.180	+0.005/-0.000	2.185	/		
	2.237	+0.005/-0.000	2.242	/		
	2.272	+0.005/-0.000	2.277	/		
	2.306	+0.005/-0.000	2.307	/		
	2.339	+0.005/-0.000	2.339	/		
	2.339	+0.005/-0.000	2.339	/		
	0.062	+/-0.010	0.062	/		
	4.26	+/-0.030	4.289	/		
	R0.063	+/-0.010	R0.063	/		
	R0.50	+/-0.030	R0.500	/		
	110.27	+/-0.060	110.290	/		

<b>Measured by:</b> G.m	<b>Audited by:</b> AWM	<b>Prototype Approval:</b> N/A
<b>Date:</b> 09.09.14	<b>Date:</b> 9-9-15	<b>Date:</b> N/A

Rev	Date	Change	Revised by	Approved
A	06.11.09	New Issue (P/O D350-748-101)	KJ/JLM	
B	07.10.24	Dwg Rev updated	KJ/EC/DD	



DESIGN <i>GP</i>	DRAWN BY <i>GP</i>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
CHECKED <i>HA</i>	APPROVED <i>HA</i>	DRAWING NO. D350-748-141	REV. D SHEET 1 OF 3
DATE 06.10.31		TITLE CROSSTUBE (AS 350/355 HI FWD)	SCALE NTS
A	06.03.31	NEW ISSUE	
B	06.06.30	ADD D6017-115 & PRIME AND PAINT	
C	06.08.14	ADD CAD PLATING	
D	06.10.31	MAG. PARTICLE AND CAD PLATE AS MFD.	

RELEASED  
06.10.31 *HA*

QTY	P/N	DESCRIPTION
X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
1	D6017-115	CROSSTUBE (OR D6015-125)
2	D3502-1	SUPPORT
2	D2856-400-710	ABRASION STRIP
1	AELS-1032-225	INSERT
1	AN960JD10	WASHER
2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
1	MS27039-1-10	SCREW

#### D350-748-141 CROSSTUBE:

- MATERIAL: MANUFACTURED FROM D6017-115 OR D6015-125  
FINISHED LENGTH = 110.27±0.06
- MACHINE PER MACHINING DETAIL ON PAGE 3. BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITIONS SHOULD BE SMOOTH. NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- SCRIBE DART PART NUMBER AND BATCH NUMBER IN THIS AREA WITH VIBRATING STYLUS
- BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING
- FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- INSTALL D2856-400-710 ABRASION STRIP WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- TORQUE MS21920-20 CLAMPS 60 TO 80 IN-LB
- TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- ALL DIMENSIONS ARE IN INCHES
- PART IS SYMMETRIC ABOUT CENTERLINE EXCEPT FOR Ø0.297 HOLE.

UNDER REVIEW

09.02.05  
Per per #09.001

OK  
09.11.24

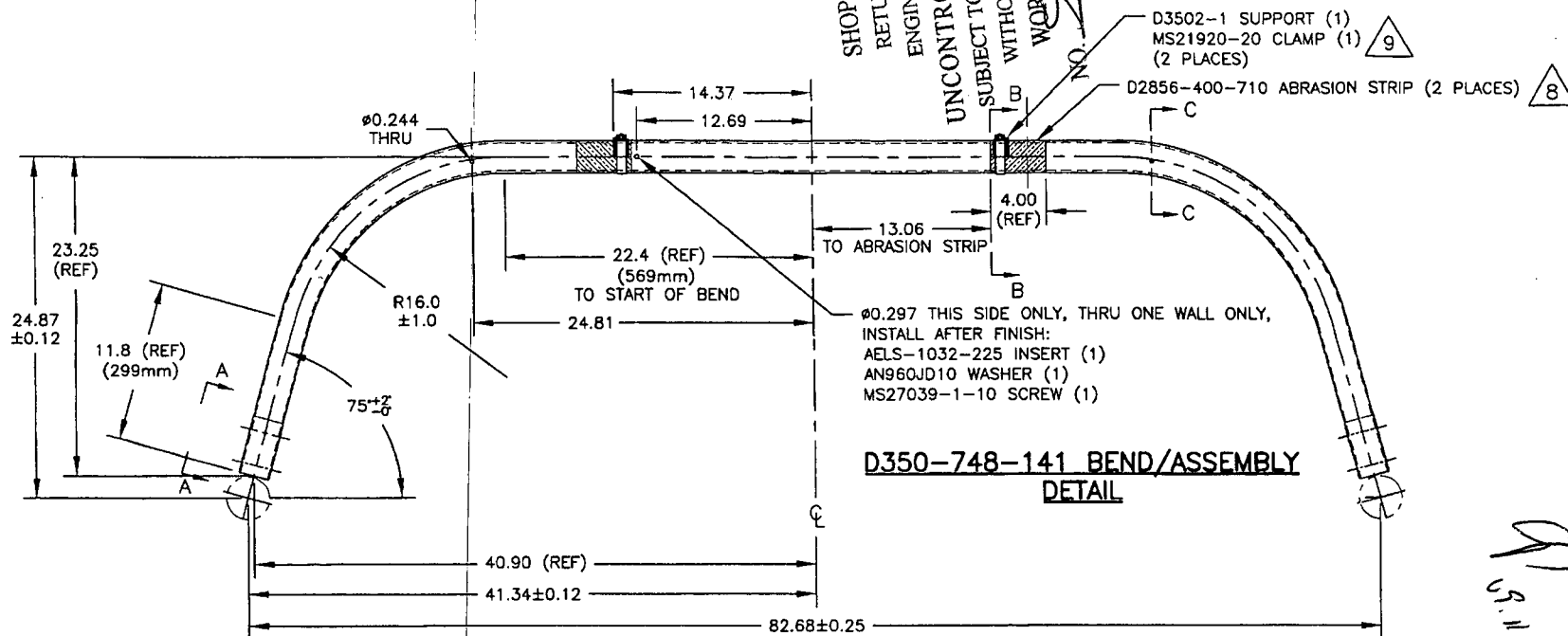
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WITHOUT NOTICE  
WORK ORDER  
NO. 50628

UNDER REVIEW  
OK 07.10.22

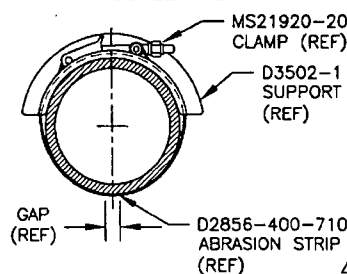
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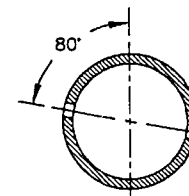
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WORK ORDER  
50628



SECTION B-B  
SCALE 1:2



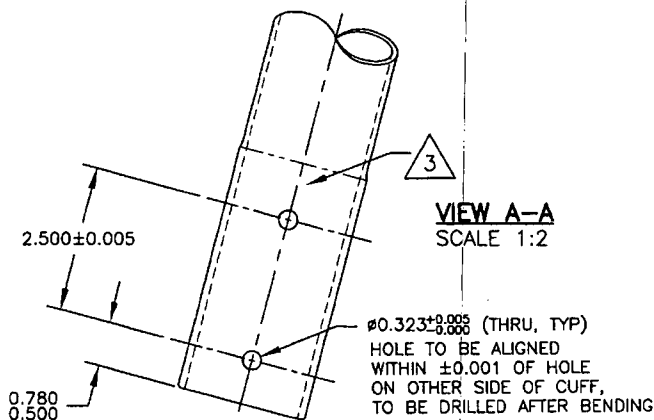
SECTION C-C  
SCALE 1:2



UNDER REVIEW  
09.02.05

UNDER REVIEW  
04.16  
OK 07.10.22

RELEASED  
06.10.31

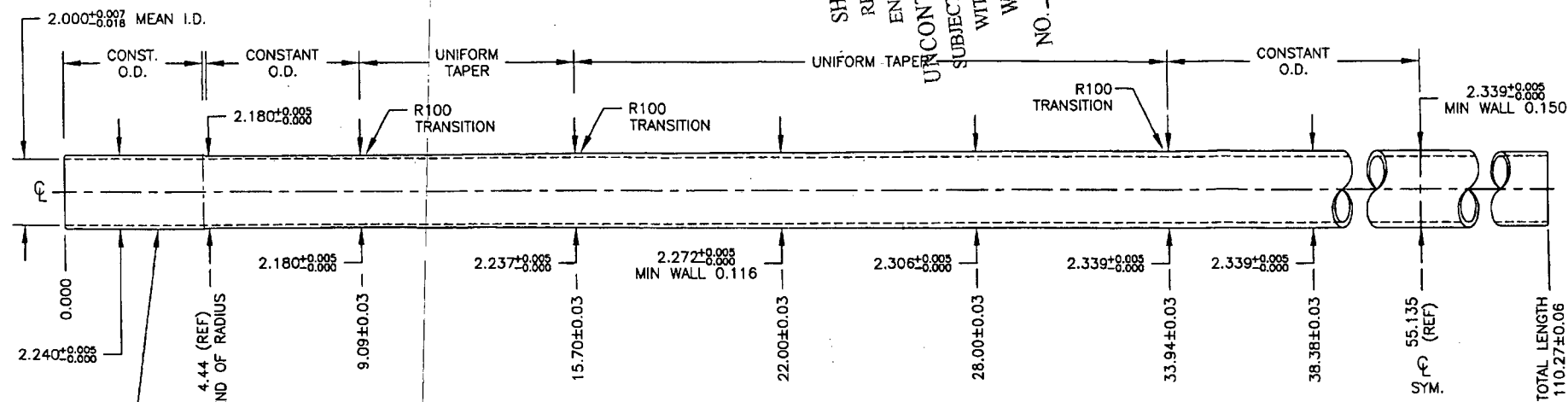


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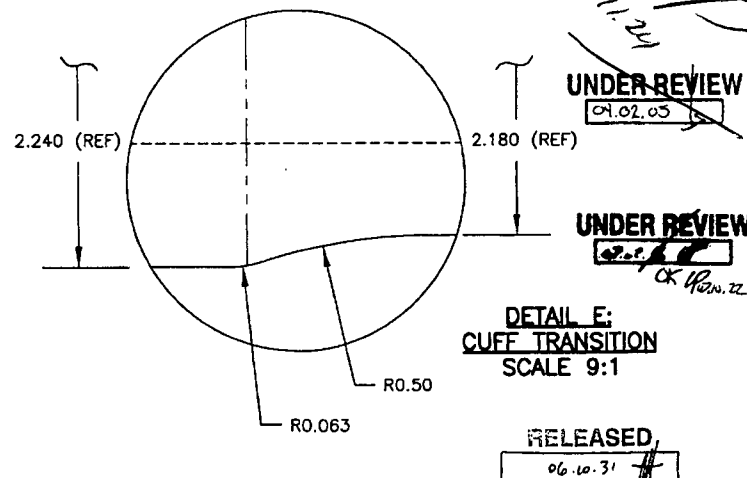
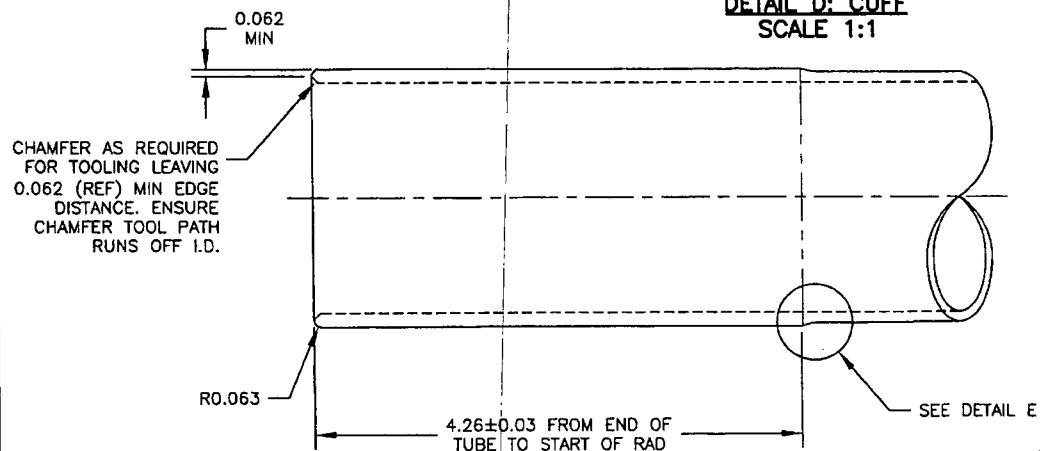
DESIGN	97	DRAWN BY	97	<b>DART</b>	DART AEROSPACE LTD. WARRICK, ONTARIO, CANADA
CHECKED	HT	APPROVED	HT	DRAWING NO.	D350-748-141
DATE	06.10.31	TITLE	CROSSTUBE (AS 350/355 HI FWD)	REV. D	SHEET 2 OF 3
				SCALE	1:8

UNIFORM TAPER  
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SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. 20628



D350-748-141 MACHINING DETAIL

**DETAIL D: CUFF**  
**SCALE 1:1**



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DATE 16.10.31	TITLE CROSSTUBE (AS 350/355 HI FWD)				SCALE



VAC AERO  
INTERNATIONAL INC.

RELEASE NO

GST No.: R105468102

OAK 113616



HEAD OFFICE  
1371 SPEERS ROAD, OAKVILLE, ONTARIO  
CANADA L6L 2X5  
TEL: (905) 827-4171 FAX: (905) 827-7489



2009 WYECROFT ROAD, UNIT B  
OAKVILLE, ONTARIO  
CANADA L6I 6J4  
TEL: (905) 827-7377 FAX: (905) 827-1380



QUEBEC DIVISION  
7450 RUE VERITE STREET, ST. LAURENT, QUEBEC  
CANADA H4S 1C5  
TEL: (514) 334-4240 FAX: (514) 334-6269

11/03/20

MM/DD/YY

PAGE: 1

BILL TO: 1DAR01  
DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

SHIP TO: DART AEROSPACE LTD.  
1270 ABERDEEN ST.  
HAWKESBURY, ON

K6A 1K7

K6A 1K7

DATE SHIPPED	SHIP VIA	F.O.B.
11/03/2009		ORIGIN
CUSTOMER P/O No.	JOB No.	TERMS
10539		NET 30 DAYS

PART No.	DESCRIPTION	UOM	QTY ORD	QTY SHPD	TEST RESULTS
D350-748	-141/241	EA	12	12	
<p>Process Specifications: Procedure: 4353 HEAT TREATED TO 180 KSI MIN. PER DRAWING 100% HARDNESS CHECKED AS PER ASTM E-18 40/45 HRC MATERIAL: 4130</p> <p>4 PIECES B48603, B48604, B48605, B48606, P/N D350-748-241 8 PIECES B50262, B50627, B50628, B50629, P/N D350-748-141 B50621, B50622, B50623, B50625</p>					
<p>100% HARDNESS TEST 12 pc. 42/43 HRC</p> <p>VA.I.O. TH. 25 Q.C.</p> <p>0 E. 11.23</p>					

I hereby certify that the material covered by this release note has been inspected and tested and conforms to all specifications relevant thereto in accordance with the conditions of the contract / or purchase order.

ON BEHALF OF VAC AERO INTERNATIONAL INC.



METAL TREATING INSTITUTE

*Shirley Robinson*  
Authorized Q.C. Inspector



VACUUM BRAZING · HEAT TREATING · SPECIAL PROCESSING · FURNACE EQUIPMENT  
TURBINE COMPONENT OVERHAUL · PLASMA AND OTHER COATINGS